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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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Norishige Nanai

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HAMRE, SCHUMANN, MUELLER & LARSON P.C.

P.O. BOX 2902-0902

MINNEAPOLIS, MN 55402

EXAMINER

SUCH, MATTHEW W

ART UNIT

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PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No. 10/562,739	Applicant(s) NANAI ET AL.	
	Examiner MATTHEW W. SUCH	Art Unit 2891	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 16 December 2008.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-20 is/are pending in the application.
- 4a) Of the above claim(s) 14-18 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-13, 19 and 20 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 29 December 2005 is/are: a) ☐ accepted or b) ☒ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☒ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|----------------------------------------------------------------------------------------|-------------------------------------------------------------------|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____ |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date <u>12/29/05 and 6/11/08</u> . | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Election/Restrictions

1. Applicant's election without traverse of Invention I, drawn to claims 1-13 and 19-20, in the reply filed on 16 December 2008 is acknowledged.

Priority

2. Receipt is acknowledged of papers submitted under 35 U.S.C. 119(a)-(d), which papers have been placed of record in the file.

Information Disclosure Statement

3. The information disclosure statements (IDS) submitted on 29 December 2005 and 11 June 2008 are being considered by the examiner.

Drawings

4. The drawings are objected to under 37 CFR 1.83(a). The drawings must show every feature of the invention specified in the claims. The claims recite peaks of a X-ray diffraction pattern for copper phthalocyanine and for sexithiophene. Therefore, the these X-ray diffraction pattern peaks must be shown or the feature(s) canceled from the claim(s). No new matter should be entered.

Corrected drawing sheets in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. Any amended replacement drawing

Art Unit: 2891

sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. The figure or figure number of an amended drawing should not be labeled as "amended." If a drawing figure is to be canceled, the appropriate figure must be removed from the replacement sheet, and where necessary, the remaining figures must be renumbered and appropriate changes made to the brief description of the several views of the drawings for consistency. Additional replacement sheets may be necessary to show the renumbering of the remaining figures. Each drawing sheet submitted after the filing date of an application must be labeled in the top margin as either "Replacement Sheet" or "New Sheet" pursuant to 37 CFR 1.121(d). If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

Double Patenting

5. Claims 8 and 9 objected to under 37 CFR 1.75 as being a substantial duplicate of claims 10 and 11, respectively.

When two claims in an application are duplicates or else are so close in content that they both cover the same thing, despite a slight difference in wording, it is proper after allowing one claim to object to the other as being a substantial duplicate of the allowed claim. See MPEP § 706.03(k).

The terms of "plate" and "film" in claims 8 and 10, respectively, do not distinguish the claims over each other since neither distinguishes the dimensional or material characteristics of a "plate" from a "film".

Claim Rejections - 35 USC § 102

6. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

7. Claims 1-5 are rejected under 35 U.S.C. 102(b) as being anticipated by Mattheus (Synth. Met., Vol. 138; supplied on IDS dated 11 June 2008).

Mattheus teaches an organic thin film comprising a substrate (a-SiO₂; Table 1, for example) and a semiconductor layer made of pentacene crystals with a crystal phase of the pentacene crystals being "the same as a crystal phase of energetically most stable bulk crystals of the organic semiconductor" (refer to Applicant's specification for the definition of this term Page 4, Lines 19-30 through Page 5 Lines 1-9). The XRD patterns of the crystals have a peak of a diffraction line corresponding to "a crystal phase of energetically most stable bulk crystals of the organic semiconductor" (see Fig. 3, for example, which shows that the $d = 1.44$ nm polymorph of the pentacene crystal is the only material in the crystals) with 100% of the layer and intensity having this configuration. The layer is positioned at $d = 1.44$ nm (also cited as 14.37 \AA in the text, see caption of Fig. 4 and Table 2, for example). The examiner notes that this value of d is the same as the claimed 1.43 since the diffraction peaks match those as shown in the Applicant's Figures (see Figure 6B, and the d value is estimated from the peak location and is calculated using Bragg's law).

Art Unit: 2891

The Examiner notes that a recitation of the intended use of the claimed invention must result in a structural difference between the claimed invention and the prior art in order to patentably distinguish the claimed invention from the prior art. If the prior art structure is capable of performing the intended use, then it meets the claim. See, e.g., *In re Pearson*, 181 USPQ 641 (CCPA); *In re Minks*, 169 USPQ 120 (Bd Appeals); *In re Casey*, 152 USPQ 235 (CCPA 1967); *In re Otto*, 136 USPQ 458, 459 (CCPA 1963). See MPEP §2114. The recitation of an organic thin film transistor does not distinguish the present invention over the prior art of Mattheus who teaches the structure as claimed and teaches that pentacene is a capable field effect transistor material (see Introduction section on Page 475).

Claim Rejections - 35 USC § 103

8. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

9. Claim 6 is rejected under 35 U.S.C. 103(a) as being unpatentable over Mattheus (Synth. Met., Vol. 138; supplied on IDS dated 11 June 2008) in view of Horowitz (Adv. Mater., Vol. 8) in view of Horowitz (Chem. Mater., Vol. 7).

Mattheus teaches the organic semiconductor crystals of claim 2 as a pentacene material, but does not teach other conventional organic semiconductor materials such as copper

Art Unit: 2891

phthalocyanine that also are useful for transistor devices and have "the same as a crystal phase of energetically most stable bulk crystals of the organic semiconductor".

However, Xiao teaches using copper phthalocyanine as an organic semiconductor material with crystals in "the same as a crystal phase of energetically most stable bulk crystals of the organic semiconductor" (refer to Applicant's specification for the definition of this term Page 4, Lines 19-30 through Page 5 Lines 1-9). The material has a single X-ray diffraction peak corresponding to $d = 1.29$ nm, which Xiao teaches agrees with the $d = 1.26$ nm value of "the most stable" single crystal (see Page 368, Results and Discussion section, Left Col.; Figure 2). The examiner notes that this value of d is the same as the claimed 1.25 since the d value is estimated from the peak location and is calculated using Bragg's law. It would have been obvious to one of ordinary skill in the art at the time the invention was made to use the copper phthalocyanine crystal material of Xiao as the organic semiconductor material of Matteus. One would have been motivated to do so since Xiao teaches that the copper phthalocyanine material is one of the most promising organic semiconductor materials and the crystalline phase has good mobility properties for transistors (see Page 369). Further regarding the selection of the specific claimed material for the organic semiconductor, it has been held that the selection of a known material based on its suitability for its intended use supported a prima facie obviousness determination in *Sinclair & Carroll Co. v. Interchemical Corp.*, 325 U.S. 327, 65 USPQ 297 (1945). See also *In re Leshin*, 227 F.2d 197, 125 USPQ 416 (CCPA 1960). MPEP § 2144.07.

Art Unit: 2891

10. Claim 7 is rejected under 35 U.S.C. 103(a) as being unpatentable over Mattheus (Synth. Met., Vol. 138; supplied on IDS dated 11 June 2008) in view of Horowitz (Adv. Mater., Vol. 8) in view of Horowitz (Chem. Mater., Vol. 7).

Mattheus teaches the organic semiconductor crystals of claim 2 as a pentacene material, but does not teach other conventional organic semiconductor materials such as sexithiophene that also are useful for transistor devices and have "the same as a crystal phase of energetically most stable bulk crystals of the organic semiconductor".

However, Horowitz (Adv. Mater., Vol. 8) teaches using sexithiophene as an organic semiconductor material with crystals in "the same as a crystal phase of energetically most stable bulk crystals of the organic semiconductor" (refer to Applicant's specification for the definition of this term Page 4, Lines 19-30 through Page 5 Lines 1-9) in an organic transistor (see Fig. 1 on Page 52). Horowitz (Adv. Mater., Vol. 8) reports the crystallographic data for the sexithiophene (Page 52, Right Col., Lines 1-2) in Horowitz (Chem. Mater., Vol. 7). The material has a single X-ray diffraction peak corresponding to $d = 2.24 \text{ nm}$ (see Horowitz, Chem. Mater., Vol. 7, Page 1338, Right Col., Line 28 reported as 44.71 \AA , but since this spacing is for 2 layers, $d = a/2$ according to Figure 2, which yields $d = 2.24 \text{ nm}$). The examiner notes that this value of d is the same as the claimed 2.24 since the d value is estimated from the peak location and is calculated using Bragg's law. It would have been obvious to one of ordinary skill in the art at the time the invention was made to use the sexithiophene crystal material of Horowitz as the organic semiconductor material of Mattheus. One would have been motivated to do so since Horowitz teaches that this stable sexithiophene has good mobility properties (see Adv. Mater., Vol. 8; Page 52, Left COL., last 3 lines; and Page 54, Left Col.). Further regarding the selection of the specific

Art Unit: 2891

claimed material for the organic semiconductor, it has been held that the selection of a known material based on its suitability for its intended use supported a prima facie obviousness determination in *Sinclair & Carroll Co. v. Interchemical Corp.*, 325 U.S. 327, 65 USPQ 297 (1945). See also *In re Leshin*, 227 F.2d 197, 125 USPQ 416 (CCPA 1960). MPEP § 2144.07.

11. Claims 8-13 and 19-20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Mattheus (Synth. Met., Vol. 138; supplied on IDS dated 11 June 2008) in view of Ong ('015).

a. Regarding claims 8-13, Mattheus teaches that the "the most stable" organic semiconductor crystals are useful for organic transistor applications (see Introduction section on Page 475, for example), but does not teach the conventional structural details of such a transistor.

However, Ong teaches a conventional organic transistor with a plastic substrate "plate" or "film" (Element 16, 36) such as polyimide, polyester, or polyacrylate (Para. 0035) with a silicon oxide gate insulator (Element 14, 34; Para. 0036) thereon, and an organic semiconductor material (Elements 12, 32) on the gate insulator. A source and drain electrode (Elements 20, 22, 40, 42) are situated across from each other to inject charges into the organic semiconductor and are each a metal material such as gold or a conductive organic (Para. 0039). It would have been obvious to one of ordinary skill in the art at the time the invention was made to form the organic transistor of Mattheus to have the structural configurations suggested by Ong. One would have been motivated to do so in order to produce a functioning device. A plastic material such as polyimide

Art Unit: 2891

allows for a flexible device (see Ong Para. 0035). Gold as the source and drain electrodes provide electrical contact to the organic semiconductor with low electrode material resistance (see Ong Para. 0039). The examiner notes that the terms of "plate" and "film" do not distinguish over the prior art since they fail to limit the structural or material configuration of the substrate material. Further regarding the selection of the specific claimed materials for the substrate and source/drain electrodes, it has been held that the selection of a known material based on its suitability for its intended use supported a prima facie obviousness determination in *Sinclair & Carroll Co. v. Interchemical Corp.*, 325 U.S. 327, 65 USPQ 297 (1945). See also *In re Leshin*, 227 F.2d 197, 125 USPQ 416 (CCPA 1960). MPEP § 2144.07.

b. Regarding claims 19 and 20, Mattheus recites using the material of claim 1 as a transistor, but does not recite the conventional structural details of a transistor or any uses of the transistor.

However, Ong teaches that organic transistors are useful in integrated circuits of displays and radio tags (see Ong Para. 0005). It would have been obvious to one of ordinary skill in the art at the time the invention was made to form a plurality of organic transistors for use in pixels of a display in order to produce a display that can show an image. It has been held that the mere duplication of parts has no patentable significance unless a new and unexpected result is produced. *In re Harza*, 274 F.2d 669, 124 USPQ 378 (CCPA 1960). See MPEP § 2144.04 VI-B. It would have been obvious to one of ordinary skill in the art at the time the invention was made to form the organic transistor

Art Unit: 2891

in an integrated circuit of an radio tag in order to form electrical connection to the device and access the transistor properties.

Conclusion

12. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Aramaki ('996), Hanazato ('203), Sakarai ('811) and Bao (Appl. Phys. Lett., Vol. 69) each teach crystalline organic semiconductor materials for improving charge carrier mobility.

Contact Information

13. Any inquiry concerning this communication or earlier communications from the examiner should be directed to MATTHEW W. SUCH whose telephone number is (571)272-8895. The examiner can normally be reached on Monday - Friday 9AM-5PM EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Sue Purvis can be reached on (571) 272-1236. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Art Unit: 2891

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Matthew W. Such/
Examiner, Art Unit 2891